Orbiting Meteoroid and Debris Counting Experiment

William H. Kinard ¹, Dwayne Armstrong ², Sharon K. Crockett ³, James L. Jones, Jr. ⁴, and Philip C. Kassel, Jr. ⁵

NASA, Langley Research Center

Hampton, VA

J. J. Wortman ⁶
North Carolina State University
Raleigh, N. C.

Abstract

The Orbiting Meteoroid and Debris Counting Experiment (OMDC) flew for approximately 90 days in a highly elliptical Earth orbit onboard the Clementine Interstage Adapter (ISA) Spacecraft. This experiment obtained data on the impact flux of natural micrometeoroids, and, it provided limited information on the population of small mass man-made debris as a function of altitude in near Earth space. The flight of the OMDC Experiment on the ISA Spacecraft also demonstrated that the ultra lightweight, low-power, particle impact detector system that was used is a viable system for flights on future spacecraft to monitor the population of small mass man-made debris particles and to map the cosmic dust environment encountered on interplanetary missions. An overview of the ISA Spacecraft mission, the approach to the OMDC Experiment and the data obtained by the experiment are presented.

I. Introduction / Background

Orbital debris represents an inescapable hazard for all space activities. Over the past several years the U.S. and international communities have recognized this present and growing threat as a dominant space environment concern in low altitude earth orbits and a growing concern in higher altitude orbits - particularly in synchronous orbits. The U.S. Congress Office of Technology Assessment has concluded that uncontrolled growth of space operations, including operations by the private sector, could eventually result in a debris population that will inflict severe limitations on space missions. Other investigative organizations, including the National Security Council and the General Accounting Office, as well as NASA and the European Space Agency, have also addressed this problem. At issue is not just the possibility of catastrophic collisions of large debris objects with spacecraft, but also surface damage to instruments and systems on spacecraft which can result from

¹ Senior Research Scientist, NASA Langley Research Center, Hampton VA

² Electronic Engineer, NASA Langley Research Center, Hampton VA

³ Mechanical Engineer, NASA Langley Research Center, Hampton VA

⁴ Research Engineer, NASA Langley Research Center, Hampton VA

⁵ Electronic Engineer, NASA Langley Research Center, Hampton VA

⁶ Professor, Electrical Engineering, North Carolina State University, Raleigh NC

impacts of very small debris particles. In fact, surface damage resulting from small particle impacts may become more of a concern in the future with the current trend to fly more and more smaller spacecraft. These small spacecraft will have a very low probability being impacted by debris large enough to inflict catastrophic damage; however, the continuous bombardment of small debris can result in surface alterations that will limit their useful lifetime on orbit.

A prerequisite to establishing the controls needed to limit future growth in the man-made debris population and to getting these controls accepted by all space faring nations is the development of adequate data bases and models to define the sources of debris and the populations, sizes and orbits of the particles that are generated by these sources. Terrestrial measurements made by the Goldstone and Haystack ground-based radars, the GEODSS telescopes, along with data from USSPACECOM are providing adequate information on the population and orbits of debris objects that are a centimeter and larger in size near the Earth. Adequate measurements of the populations of smaller debris particles are not yet being made.

To date the LDEF experiments have provided the best indications of the small mass debris populations; however, separating the man-made debris impacts on these experiments from the natural meteoroid impacts has proven to be difficult. Also the LDEF provided data on debris only at the altitude of its near circular orbit (approximately 430 km). Prior to the Clementine mission there had been essentially no measurements that were focused on the populations of small mass debris at high altitudes and particularly near the synchronous orbits.

The Clementine ISA spacecraft, which flew in a highly elliptic orbit with a perigee altitude of approximately 127,000 km, spent most of its orbiting lifetime at altitudes above the orbits of manmade debris; thus, it provided an opportunity to obtain data on the natural meteoroid environment with no confusion introduced by man-made debris impacts. The ISA spacecraft's low perigee altitude, approximately 290 km, also allowed limited times to obtain data on the population of debris as a function of altitude. The OMDC Experiment was flown on the ISA spacecraft to take advantage of these opportunities and to establish whether or not the new detectors used in the experiment are a viable candidate for future spacecraft flights to monitor changes in man-made debris populations and to measure the natural meteoroid environments encountered during interplanetary missions.

The OMDC Experiment development, integration and post flight analysis were funded by the NASA Office of Advanced Concepts. The NASA Langley Research Center (LaRC) provided the overall management of the experiment and LaRC personnel designed and manufactured in-house all elements of the experiment hardware with the exception of the detectors. The impact detectors were developed and manufactured by faculty and students at North Carolina State University. Personnel at the Institute of Space Science and Technology generated the science requirements to supported the experiment development.

It is worthy to note that the OMDC Experiment was designed, manufactured, tested, and integrated on the ISA Spacecraft in less than 4 months and at a cost of only \$200,000, and that the experiment hardware meet all Clementine Program requirements including requirements that it weigh approximately 460 grams and use less than 10 milli watts of power.

II. General Approach

The basic approach to the OMDC Experiment was to measure the impact frequencies of sub micron particles as a function of time and spatial position. It was assumed that the impacts detected at altitudes above 46,000 km, the altitude of satellites in synchronous orbits, will be the result of collisions

with natural meteoroids only. Knowing the effects of the Earth's gravitational focusing of these meteoroids, it was also assumed that the natural meteoroid impact fluxes at lower altitudes can be established from flux measurements made at altitudes above 46,000 km. At altitudes below 46,000 km impacts of both natural meteoroids and man-made debris particles will be detected. The debris impact fluxes at these altitudes can be established by subtracting the calculated natural meteoroid impact flux from the combined meteoroid and debris flux measurements obtained by the OMDC Experiment.

III. MOS Detectors

The OMDC Experiment utilized improved ultra-light weight MOS (metal-oxide-silicon) impact detectors that are a derivative of the MOS detectors flown earlier in the Interplanetary Dust Experiment (IDE)⁶ on the Long Duration Exposure Facility (LDEF) and on the Meteoroid Technology Satellite (MTS)⁷. The improved MOS detectors, which were rectangular 3.9 cm wide and 7.7 cm long, were manufactured from 10.2 cm diameter silicon wafers cut 0.3 mm thick. A schematic of the detector and electrical connections is illustrated in Figure 1.

The surfaces of the 10.2 cm silicon wafers were oxidized to produce a silicon dioxide layer 1.0 µm thick. The wafers were then masked to the rectangular detector shape and aluminum was vapor deposited to a thickness of 0.1µm on the silicon dioxide layer on the front. The aluminum and the silicon substrate thus formed the plates of a capacitor. The silicon dioxide layer formed the capacitor dielectric. These capacitors were charged to a nominal 43 volt bias. Impacts of particles having sufficient mass and velocity to penetrate the silicon dioxide dielectric layer will discharge the capacitor and the discharge current flow will burn the vapor deposited aluminum layer away from the region surrounding the impact site, thus allowing the capacitor to be recharged. The capacitor discharges are monitored to detect the particle penetration events. Extensive laboratory calibrations of the MOS detectors have established the impacting particle mass and velocities that are required for detection. The detectors weighed approximately .5 gram each, an order of magnitude less than the similar MOS detectors that were used earlier on the LDEF IDE and on the MTS. Figure 2. shows photographs of an OMDC detector and for comparison an earlier IDE detector.

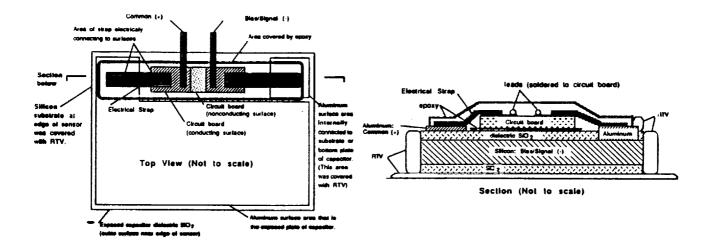


Figure 1. Schematic of the MOS detectors and electrical connections used on the OMDC Experiment. (Not to scale)

A photograph of an OMDC detector and, for comparison, a photograph of an earlier IDE detector are shown in Figure 2.

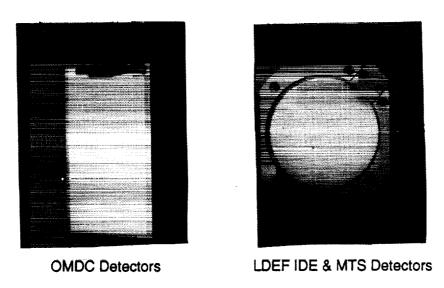


Figure 2. Photographs of the MOS detector used on the OMDC Experiment and the MOS detector used on the LDEF IDE and the MTS.

IV. Detector Installation

A total of 54 of the MOS detectors were installed, using RTV 566 adhesive, in a ring on the exterior of the ISA Spacecraft structure at the same time and in the same manner as the spacecraft solar cells were installed. The bonding of the detectors directly to the spacecraft surface, rather than installing the detectors in a mount that is mechanically fastened to the spacecraft, as was done on LDEF, resulted in significant weight savings. Photographs of the detectors mounted on the ISA Spacecraft are shown in Figure 3.



Figure 3. Photographs of OMDC Experiment detectors installed on the ISA Spacecraft.

After installation, the edges of the detectors were sealed with RTV 142 to prevent current leakage through any plasma that may exist on orbit around the spacecraft. Later, based on data from electrical status checks and on the observations that some of installed detectors were badly shadowed by other spacecraft parts, 48 of the 54 installed detectors were selected to be actively connected to the OMDC Experiment electronic system. The wiring harness connecting the selected detectors and the experiment electronics was also tacked to the spacecraft structure with RTV 142 adhesive. Both the RTV 566 and the RTV 142 were chosen for their low-outgassing properties and previous space use qualifications.

V. Electronic System

The selected 48 active detectors were electrically connected to form 3 arrays of 16 detectors each. Each array covered a 1200 segment of the spacecraft surface. The 16 detectors in each array were electrically partitioned into 2 groups - one having 9 detectors and one having 7 detectors. This partitioning of one array of the detectors and the block diagram for the electronics associated with that array is shown in Figure 4.

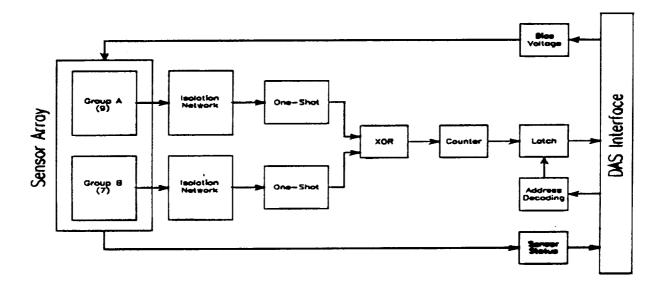


Figure 4. Block diagram of electronics associated with each of the 3 arrays of detectors.

Laboratory test data has shown that the MOS detectors require a minimum bias of 30 volts and a nominal operating bias of 43 volts. Since the load presented by the detectors was essentially capacitive, little drive current was required to achieve the bias. A 12 volt oscillator was created for use in the OMDC as an input to a voltage quadrupler. The output of the voltage quadrupler was then regulated to be the required 43 volt bias source. The bias supplied to each detector was current limited by a 2.2 meg. ohm resister to prevent overloading of the bias supply in the event a detector was permanently shorted.

The signal leads from each group of detectors were paralleled. A particle impact on one detector causes a temporary short which discharges that detector. An isolation network was used to prevent the other detectors in the group from also being discharged through this temporary short. A one-shot was used to sense the temporary shorting of an impacted detector. The output of this one-shot in each group, which was XORed to allow simultaneous detection of impacts on the other group in the same array, clocked a counter to record the total number of impacts for the entire array.

Each array was memory mapped by the ISA spacecraft Data Acquisition System (DAS). Each counter was isolated from the data bus by a Class C radiation hardened HCS245 to prevent the OMDC Experiment from seizing control of the data bus in the event of an experiment system failure. When the correct address for an array was decoded, the appropriate HCS245 latched the data and put it on the data bus to be read by the DAS.

The health of all of the OMDC Experiment in terms of the number of detectors that developed shorts was monitored by a status circuit. The leakage current of each array of detectors was converted to a voltage by a trans-impedance amplifier. Each status voltage was inputted to a passive summer whose output was buffered by a voltage follower. This signal was read by the DAS and converted to a digital word representing the overall health of the detectors.

The fault tolerance that could be built into the experiment electronic system was limited by the extremely severe power, size and weight constraints. Redundancy in the ground wiring of the detector harness was, however, implemented such that two breaks of ground wires would be required to lose more than one detector.

The ISA Spacecraft DAS sampled the array counters once every 5 seconds. If an impact was detected, the value of the counters and the value of the system clock was written to memory. The detector status was sampled by the DAS every 10 minutes and written to memory. The OMDC Experiment data was broadcast with the other ISA Spacecraft telemetry signals upon ground commands.

VI. Testing

The method used to install the MOS detectors on the ISA Spacecraft structure was verified in thermal/vacuum test and in vibration test that were run on a test assembly. The experiment electronic system was also subjected to thermal/vacuum and vibration test, and, it underwent complete functional, workmanship and acceptance testing as a unit before it was integrated into the spacecraft DAS. After the OMDC Experiment electronic system was installed in the DAS, it underwent further environmental, acceptance and performance testing as a part of the ISA Spacecraft.

VII. Data Obtained

The originally planned apogee altitude for the ISA Spacecraft was approximately 195,000 km and with that perigee the prelaunch orbiting lifetime was predicted to be greater than 1 year. The ISA Spacecraft actually achieved an apogee of only 127,000 km. With this lower apogee the spacecraft orbiting lifetime proved to be only 3 months and thus the data sample obtained by the OMDC Experiment was reduced. There were also other situations that developed with the ISA Spacecraft that have created some difficulties in analyzing the OMDC Experiment data. First, there were spacecraft telemetry command and receiving problems that resulted in the loss of precise timing data and thus the orbit position for some of the impact events that were detected. No impacts were lost however. The data obtained was more than adequate to demonstrate the excellent performance of the new MOS detectors that were used. The data was also adequate to provide valuable information on the natural meteoroid environment near the Earth and an indication of the variation in the man-made debris population with altitude.

The OMDC Experiment health status circuit indicated that all of the 48 active detectors probably remained operational for the entire mission duration - even the last several orbits when the perigee altitude was rapidly dropping. In a worse case scenario, no more that one or two of the detectors could have developed permanent shorts. Thus for analysis purposes, the active sensing area for the experiment during the mission was a well defined quantity. All other ISA Spacecraft

housekeeping data that related to the OMDC Experiment indicated nominal performance of the experiment. The complete data set that was obtained is presented in Table I. The first column of the Table I presents the calendar date and time of broadcasts that contained new impact counts. The second and third columns lists the day of the year and the orbit respectively that new impact counts were recorded. The fourth and fifth columns lists the accumulated counts transmitted from each of the three array counters and the number of new events indicated by each array counter respectively. The sixth column lists the radial distance from the center of the Earth to the spacecraft location when a new event was detected. In those situations where multiple events were transmitted in a single transmission, the radial distance to the point of impact of the last of the multiple events only is known. The seventh and eighth columns lists the angle from perigee and the hours from perigee.

It should be mentioned that the ISA Spacecraft had no attitude control or attitude measuring systems, and the attitude motions of the spacecraft could not be predicted analytically. It was hoped that ground observations of the ISA Spacecraft during perigee passages would provide some indications of the orientation, but they did not. Since the detectors on the OMDC Experiment did not present equal detecting areas in all directions around the spacecraft, the unknown ISA Spacecraft orientation results in uncertainties in the analysis.

The early analysis of the data from the OMDC Experiment have been made and published.^{9, 10}

VIII. Conclusions

The flight of the OMDC Experiment on the ISA Spacecraft has demonstrated that useful data can be obtained with small, light weight, low power and inexpensive instruments that are developed and flown in a short period of time. The experiment is evidence of the positive side of the trend to smaller, cheaper and quicker spacecraft. The OMDC Experiment has also demonstrated that the ultralight weight new MOS detectors that were used are excellent detectors for use on future near Earth spacecraft to monitor the small mass man-made debris population and on interplanetary spacecraft to monitor map the natural meteoroid environments encountered during the mission.

TABLE I
Accumulated Impacts - OMDC Experiment on ISAS

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04/29/94 15:41	04/29/94 14:51	119.6189	178	11	8	14	33			6		87.3	
04/23/94 18:00	04/29/94 15:03	119.6274	178	11	8	15	34			1			
04/29/94 (23:23) 119.9749 178 11 8 18 37 1 5.39E-04 148.0 3.56 04/29/94 (23:23) 119.9749 178 11 8 19 38 1 9.30E+04 162.8 8.95 04/30/94 (25:56) 120.7014 178 11 8 20 39 1 1.33E+05 180.7 28.38 04/30/94 (25:56) 120.9562 178 11 8 20 39 1 1.33E+05 180.7 28.38 05/01/94 (25:56) 120.9562 178 11 8 22 41 1 1.27E+05 185.9 32.50 05/01/94 (30:55) 121.1635 178 11 8 22 41 1 1.13E+05 190.9 37.47 05/01/94 (30:55) 121.6651 178 11 8 23 42 1 1 4.24E+04 218.8 44.58 05/04/94 (15:31) 124.6467 180 12 18 24 44 1 1 1.27E+05 174.5 19.00 05/05/94 (23:55) 125.9968 180 12 10 24 46 1 3.12E+04 33.6 0.47 05/06/94 01:02 126.0405 180 12 10 24 46 1 3.12E+04 33.6 0.47 05/06/94 07:12 125.3005 181 12 12 25 48 1 3.62E+04 180.7 7.77 05/06/94 08:38 126.3903 181 12 12 25 48 1 3.62E+04 180.7 7.77 05/06/94 03:20 126.6459 181 12 13 25 50 1 1.05E+05 180.5 114.0 05/06/94 03:22 126.5573 181 12 13 26 51 1 1.33E+05 181.0 13.93 05/07/94 03:07 127.3909 181 12 13 28 53 1 1.33E+05 181.0 27.395 05/07/94 03:52 127.2855 181 12 13 28 53 1 1.33E+05 181.0 27.305 05/07/94 03:52 127.416 181 12 13 28 54 1 1.30E+05 181.0 27.305 05/07/94 03:52 127.695 181 12 13 28 54 1 1.30E+05 181.0 27.305 05/07/94 03:52 127.4178 181 12 19 28 59 1 1.08E+05 185.0 31.43 05/07/94 10:01 127.6533 181 12 19 28 59 1 1.09E+05 185.0 31.43 05/07/94 16:01 127.74178 181 12 19 28 59 1 1.09E+05 185.0 31.43 05/07/94 16:01 127.74178 181 12 19 28 59 1 1.09E+05 185.0 34.58 05/07/94 16:01 127.7650 181 12 13 28 53 1 1.09E+05 185.0 34.58 05/07/94 16:01 127.7950 181 12 13 28 53 1 1.09E+05 185.0 34.	04/29/94 15:41	119.6535	178	11	8	16	35			1	2.60E+04	125.1	
04/29/94 23:23 119:9749 178 11 8 19 38 1 1 9.30E+04 162.8 8.95 04/30/94 18:50 120.7014 178 11 8 20 39 1 1 1.30E+05 180.7 28.38 04/30/94 22:56 120.9582 178 11 8 20 39 1 1 1.30E+05 180.7 28.38 05/01/94 03:55 121.635 178 11 8 20 39 1 1 1.30E+05 190.9 37.47 05/01/94 15:01 121.6261 178 11 8 23 42 41 1 1 1.30E+05 190.9 37.47 05/01/94 15:01 121.6261 178 11 8 23 42 41 1 1 1.27E+05 180.9 37.47 05/01/94 15:01 121.6261 178 11 8 23 42 44 1 1 1 1.27E+05 190.9 37.47 05/01/94 13:05 125.9688 180 12 9 24 45 1 1 1.27E+05 174.5 190.9 05/05/94 03:05 125.9968 180 12 9 24 45 1 1 1.32E+04 33.6 0.47 05/05/94 03:05 125.9968 180 12 10 24 46 1 1 3.12E+04 131.5 1.59 05/06/94 05:26 126.2284 180 12 11 24 47 1 1 7.43E+04 131.5 1.59 05/06/94 05:26 126.2284 180 12 11 24 47 1 1 7.43E+04 158.7 5.98 05/06/94 08:38 126.3603 181 12 12 25 48 1 1 8.62E+04 160.7 7.77 05/06/94 08:38 126.3603 181 12 12 25 48 1 1 9.44E+04 163.3 9.20 05/06/94 05:05 126.2284 180 12 13 26 50 1 1 9.44E+04 163.3 9.20 05/06/94 05:05 126.2285 181 12 13 25 50 1 1 1.05E+05 189.6 13.33 05/07/94 03:07 127.1300 181 12 13 28 53 1 1 1.32E+05 189.6 13.33 05/07/94 03:07 127.1300 181 12 13 28 53 1 1 1.32E+05 189.6 13.33 05/07/94 03:07 127.3300 181 12 13 28 53 1 1 1.32E+05 180.6 13.93 05/07/94 06:52 127.2855 181 12 14 28 54 1 1 1.30E+05 181.0 28.73 05/07/94 06:52 127.2855 181 12 14 28 54 1 1 1.30E+05 181.0 28.73 05/07/94 06:52 127.476 181 12 15 28 55 1 1 1.2EE+05 185.0 31.43 05/07/94 10:01 127.4178 181 12 19 28 59 1 1 1.05E+05 185.0 31.43 05/07/94 16:01 127.476 181 12 19 28 59 1 1 1.05E+05 183.0 31.43 05/07/94 16:01 127.4765 181 12 19 28 59 1 1 1.05E+05 183.0 33.77 05/07/94 16:01 127.4765 181 12 19 28 59 1 1 1.00E+05 194.5 40.46 05/07/94 16:01 127.4765 181 12 19 31 62 1 1 1.00E+05 194.5 40.46 05/07/94 16:01 127.4765 181 12 19 31 62 1 1 1.00E+05 194.5 40.46 05/07/94 16:01 127.4765 181 12 12 23 31 68 1 1 1.00E+05 194.5 40.46 05/07/94 16:01 127.4765 181 12 12 23 31 68 1 1 1.00E+05 194.5 40.46 05/07/94 16:01 127.4765 181 12 23 31 68 1 1 1.00E+05 194.5 40.46 05/07/94 16:01 127.4765 181 12 25 3	04/29/94 16:01	119.6678	178	11	8	17	36			1	3.09E+04		
04/30/94 16:50 120.7014 178 11 8 20 39 1 1 1.33E+05 180.7 26.38 04/30/94 22:56 120.9562 178 11 8 21 40 1 1 1.27E+05 185.9 32.50 05/01/94 03:55 121.1835 178 11 8 22 41 1 1 1.37E+05 180.9 37.47 05/01/94 15:01 121.6261 178 11 8 22 41 1 1 1.37E+05 180.9 37.47 05/01/94 15:01 121.6261 178 11 8 22 41 1 1 1.37E+05 180.9 37.47 05/04/94 15:01 121.6261 178 11 8 22 41 1 1 1.37E+05 180.9 37.47 05/04/94 15:01 121.6261 178 11 8 22 41 1 1 1.27E+05 174 5 190.00 05/05/94 23:55 125.9868 180 12 9 24 45 1 1 1.27E+05 174 5 190.00 05/05/94 03:25 125.9458 180 12 9 24 45 1 1 1.27E+04 33.6 0.47 05/06/94 05:25 126.9451 180 12 10 24 46 1 1 1.27E+04 33.6 0.47 05/06/94 05:25 126.935 180 12 10 24 46 1 1 1.27E+04 131.5 1.59 05/06/94 05:25 126.935 180 12 10 24 46 1 1 3.2E+04 131.5 1.59 05/06/94 05:25 126.9305 181 12 11 25 48 1 1 9.44E+04 156.7 5.98 05/06/94 05:25 126.9305 181 12 11 25 48 1 1 9.44E+04 160.7 7.77 05/06/94 06:25 126.94619 181 12 13 25 50 1 1 1.05E+05 166.5 11.40 05/06/94 07:04 17:05 126.4519 181 12 13 26 51 1 1.35E+05 166.5 11.40 05/06/94 07:04 17:0509 181 12 13 26 51 1 1.15E+05 169.6 13.93 05/07/94 07:07 177.1300 181 12 13 26 53 1 1 1.32E+05 180.0 28.73 05/07/94 06:52 127.2435 181 12 13 26 53 1 1 1.32E+05 181.8 27.67 05/07/94 06:52 127.2435 181 12 15 28 55 1 1 1.32E+05 181.8 27.67 05/07/94 06:52 127.2435 181 12 15 28 55 1 1 1.32E+05 185.0 31.43 05/07/94 06:52 127.695 181 12 15 28 55 1 1 1.22E+05 185.0 31.43 05/07/94 05:52 127.6967 181 12 19 28 59 1 1 1.07E+05 185.0 31.43 05/07/94 15:41 127.6969 181 12 19 28 59 1 1 1.07E+05 185.0 39.41 05/07/94 15:41 127.6969 181 12 19 30 61 1 1.07E+05 185.0 39.11 05/07/94 15:41 127.6969 181 12 19 30 61 1 1.07E+05 185.0 39.11 05/07/94 15:41 127.6969 181 12 29 31 65 1 1 2.2E+05 185.0 39.11 05/07/94 15:41 127.6969 181 12 29 31 65 1 1 2.2E+05 185.0 39.11 05/07/94 15:41 127.6969 181 12 29 31 65 1 1 1.07E+05 183.0 39.11 05/07/94 15:41 127.6969 181 12 29 31 65 1 1 1.07E+05 183.0 39.11 05/07/94 15:41 127.6969 181 12 29 31 65 1 1 1.07E+05 183.0 39.11 05/07/94 15:41 127.6969 181 12 25 33 68 1 1 1.07E+06 1	04/29/94 18:00	119.7505	178	11	8	18	37			1	5.39E+04		
04/30/94 22:56 120,9552 178 11 8 21 40 1 1.2/TE-05 185.9 32.50 05/01/94 03:55 121.1835 178 11 8 22 41 1 1 1.3E-05 190.9 37.47 05/01/94 15:01 121.8261 178 11 8 23 42 1 1 4.24E-04 218.8 48.58 05/04/94 15:31 124.6467 180 12 8 24 44 1 1 1.2/TE-05 174.5 190.0 05/05/94 03:55 125.9681 180 12 9 24 45 1 1 1.32E-04 93.6 0.47 05/05/94 03:55 125.9681 180 12 10 24 46 1 1 3.12E-04 93.6 0.47 05/05/94 05:26 128.284 180 12 11 24 46 1 1 3.12E-04 131.5 1.59 05/05/94 05:26 128.284 180 12 11 24 47 1 7.43E-04 158.7 5.98 05/05/94 06:38 128.3603 181 12 11 25 48 1 1 8.62E-04 160.7 7.77 05/05/94 08:38 128.3603 181 12 12 25 49 1 9.44E-04 163.3 9.20 05/05/94 06:38 128.3603 181 12 13 25 50 1 1 1.05E-05 168.5 11.40 05/05/94 02:10 127.0909 181 12 13 26 51 1 1 1.5E-05 168.6 13.93 05/07/94 02:10 127.0909 181 12 13 26 51 1 1 1.5E-05 168.6 13.93 05/07/94 02:10 127.2435 181 12 13 28 53 1 1 1.33E-05 181.0 28.73 05/07/94 03:07 127.1300 181 12 13 28 53 1 1 1.32E-05 181.0 28.73 05/07/94 05:50 127.2435 181 12 13 28 55 1 1 1.33E-05 181.0 28.73 05/07/94 05:52 127.2855 181 12 14 28 54 1 1 1.30E-05 181.8 27.87 05/07/94 05:52 127.2855 181 12 15 28 55 1 1 1.28E-05 181.0 28.73 05/07/94 07:48 127.3250 181 12 15 28 55 1 1 1.28E-05 185.0 31.43 05/07/94 10:01 127.478 181 12 15 28 55 1 1 1.28E-05 185.0 31.43 05/07/94 16:12 127.5923 181 12 19 28 59 1 1 1.08E-05 185.0 31.43 05/07/94 16:12 127.5923 181 12 19 28 59 1 1 1.08E-05 185.0 31.43 05/07/94 16:12 127.5923 181 12 19 28 59 1 1 1.08E-05 185.0 31.43 05/07/94 16:12 127.6938 181 12 19 30 61 1 1.07E-05 183.0 39.11 05/07/94 16:12 127.6938 181 12 19 30 61 1 1.07E-05 194.5 40.24 05/07/94 16:12 127.6938 181 12 19 30 61 1 1.07E-05 194.5 40.24 05/07/94 16:12 127.6938 181 12 19 30 61 1 1.08E-06 194.5 40.24 05/07/94 16:12 127.6938 181 12 28 37 68 1 1 1.08E-06 194.5 40.24 05/07/94 16:12 127.6938 181 12 28 37 68 1 1 1.08E-06 194.5 40.24 05/07/94 16:10 127.4785 181 12 23 31 64 1 1 1.08E-06 194.5 40.24 05/07/94 16:10 127.4785 181 12 23 31 68 1 1 1.08E-06 194.5 40.24 05/07/94 16:10 127.4785 181 12 25 33 70 1 1 1.08E-06 194.5 40.	04/29/94 23:23	119.9749	178	11	8	19	38]	1	9.30E+04	162.8	
05/01/94 15:01 121.6251 178 11 8 22 41 1 1.13E+05 190.9 37.47 05/01/94 15:01 121.6261 178 11 8 23 42 1 1 4.24E+04 218.8 48.58 05/04/94 15:31 124.6467 180 12 8 24 44 1 1 1 1.27E+05 174.5 19.00 05/05/94 02:55 125.9681 180 12 9 24 45 1 1 1.27E+04 93.6 0.47 05/05/94 01:02 126.0435 180 12 10 24 46 1 1 1.32E+04 93.6 0.47 05/05/94 05:26 128.2284 180 12 11 24 47 1 1 7.43E+04 158.7 5.98 05/06/94 05:26 128.2284 180 12 11 25 48 1 1 8.82E+04 180.7 7.77 05/06/94 06:38 126.3603 181 12 11 25 48 1 1 8.82E+04 180.7 7.77 05/06/94 06:38 126.3603 181 12 11 25 48 1 1 8.82E+04 180.7 7.77 05/06/94 06:38 126.3603 181 12 12 25 49 1 1 9.44E+04 163.3 9.20 05/06/94 06:38 126.3603 181 12 12 25 50 1 1 1.05E+05 168.5 11.40 05/06/94 02:01 127.0909 181 12 13 27 52 1 1 1.33E+05 181.0 28.73 05/07/94 02:01 127.0909 181 12 13 27 52 1 1 1.33E+05 181.0 28.73 05/07/94 03:07 127.1300 181 12 13 28 53 1 1 1.32E+05 181.0 28.73 05/07/94 05:02 127.2435 181 12 14 28 54 1 1 1.32E+05 181.0 28.73 05/07/94 05:02 127.2435 181 12 14 28 54 1 1 1.00E+05 184.1 30.40 05/07/94 07:48 127.3250 181 12 18 28 55 1 1 1.28E+05 185.0 31.43 05/07/94 07:48 127.3250 181 12 18 28 55 1 1 1.28E+05 185.0 31.43 05/07/94 18:41 127.6538 181 12 19 28 56 1 1 1.27E+05 185.8 32.35 05/07/94 18:41 127.6538 181 12 19 28 56 1 1 1.27E+05 185.8 32.35 05/07/94 18:41 127.6538 181 12 19 28 56 1 1 1.07E+05 183.0 39.11 05/07/94 18:41 127.6538 181 12 19 28 59 1 1 1.08E+05 194.5 40.24 05/07/94 18:41 127.6538 181 12 19 30 81 1 1 0.0E+05 194.5 40.24 05/07/94 18:41 127.6538 181 12 19 30 81 1 1 0.0E+05 194.5 40.24 05/07/94 18:41 127.6538 181 12 19 30 81 1 1 0.0E+05 194.5 40.24 05/07/94 18:41 127.6538 181 12 19 30 81 1 1 0.0E+05 194.5 40.24 05/07/94 18:41 127.6538 181 12 19 30 81 1 1 0.0E+05 194.5 40.24 05/07/94 18:41 127.6538 181 12 19 30 81 1 1 0.0E+05 194.5 40.24 05/07/94 18:41 127.6538 181 12 25 31 88 1 1 0.0E+05 194.5 40.24 05/07/94 18:41 127.6538 181 12 25 31 88 1 1 0.0E+05 194.5 40.24 05/07/94 18:21 127.7650 181 12 25 33 88 1 1 0.0E+05 194.5 40.24 05/07/94 18:21 127.7650 181 12 25 33 77 1 1 0.0E+05 1	04/30/94 16:50	120.7014	178	11	8	20	39			1	1.33E+05		
05/01/94 15:01 121.0261 178 111 8 33 42 1 1 4.24E+04 218.8 48.58 05/04/94 15:31 124.6467 180 12 8 24 44 1 1 1 1.27E+05 174.5 19.00 05/05/94 23:55 125.9968 180 12 9 24 45 1 1 1.32E+04 33.5 0.47 05/05/94 05:26 126.0435 180 12 10 24 46 1 1 3.2E+04 131.5 1.59 05/05/94 05:26 126.2284 180 12 11 24 47 1 1 7.43E+04 133.5 1.59 05/05/94 05:26 126.2284 180 12 11 24 47 1 1 7.43E+04 156.7 5.98 05/05/94 05:26 126.2364 180 12 11 24 47 1 1 7.43E+04 150.7 5.98 05/05/94 05:26 126.3005 181 12 11 25 48 1 1 8.62E+04 190.7 7.77 05/06/94 06:36 126.3063 181 12 12 25 49 1 1 9.44E+04 160.7 7.77 05/06/94 06:36 126.3663 181 12 13 25 50 1 1 .05E+05 160.5 160.5 11.40 05/06/94 13:22 126.5573 181 12 13 32 50 1 1 .13E+05 160.6 11.40 05/06/94 03:20 127.300 181 12 13 26 51 1 1 .15E+05 160.6 13.93 05/07/94 02:10 127.0909 181 12 13 26 51 1 1 .13E+05 181.8 27.67 05/07/94 06:52 127.2855 181 12 13 28 53 1 1 .32E+05 181.0 28.73 05/07/94 06:52 127.2855 181 12 15 28 55 1 1 1.30E+05 184.1 30.40 05/07/94 06:52 127.2855 181 12 15 28 55 1 1 1.28E+05 185.0 31.43 05/07/94 06:52 127.2855 181 12 16 28 56 1 1 1.27E+05 185.0 31.43 05/07/94 07:48 127.3250 181 12 16 28 56 1 1 1.27E+05 185.0 31.43 05/07/94 10:01 127.4176 181 12 19 28 59 1 1 1.08E+05 187.9 34.58 05/07/94 15:54 127.6698 181 12 19 28 59 1 1 1.08E+05 194.5 34.58 05/07/94 15:54 127.6698 181 12 19 30 61 1 1.07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 19 30 61 1 1.07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 23 31 66 1 1 .07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 25 33 70 1 1 .07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 25 33 70 1 1 .07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 25 33 70 1 1 .07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 25 33 70 1 1 .07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 25 33 70 1 1 .07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 25 33 70 1 1 .07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 25 33 70 1 1 .07E+05 194.8 40.46 05/07/94 15:54 127.6698 181 12 25 33 70 1 1 .07E+05 194.8	04/30/94 22:56	120.9562	178	11	8	21	40			1	1.27E+05	185.9	
05/03/94 15:31 124.6467 180 12 8 24 44 1 1 1.2TE+05 174.5 19.00 05/05/94 23:55 125.9968 180 12 9 24 45 1 1.32E+04 33.6 0.47 05/05/94 23:55 125.9968 180 12 10 24 46 1 1 3.12E+04 131.5 1.59 05/05/94 05:26 126.2284 180 12 11 24 47 1 1 7.43E+04 156.7 156.7 5.98 05/05/94 07:12 128.3005 181 12 11 24 47 1 1 7.43E+04 160.7 7.77 05/05/94 07:12 128.3005 181 12 11 25 48 1 1 9.44E+04 160.7 7.77 05/05/94 07:12 128.3005 181 12 11 25 48 1 1 9.44E+04 163.3 9.20 05/05/94 10:50 128.4519 181 12 13 25 50 1 1 1.05E+05 166.5 111.40 05/07/94 02:10 127.0909 181 12 13 26 50 1 1 1.05E+05 166.6 113.93 05/07/94 02:10 127.0909 181 12 13 26 50 1 1 1.33E+05 181.0 28.73 05/07/94 06:07 127.1300 181 12 13 28 53 1 1 1.32E+05 181.0 28.73 05/07/94 06:05 127.2435 181 12 14 28 54 1 1 1.30E+05 184.1 30.40 05/07/94 06:05 127.2435 181 12 14 28 54 1 1 1.30E+05 184.1 30.40 05/07/94 07:08 127.2435 181 12 16 28 55 1 1 1.2E+05 185.0 31.43 05/07/94 07:08 127.2435 181 12 16 28 56 1 1 1.2TE+05 185.0 31.43 05/07/94 07:08 127.2435 181 12 19 28 59 1 1 1.2E+05 185.0 31.43 05/07/94 14:12 127.5923 181 12 19 28 59 1 1 1.2E+05 185.0 31.43 05/07/94 14:12 127.5923 181 12 19 28 59 1 1 1.2E+05 185.0 31.43 05/07/94 15:41 127.5923 181 12 19 28 59 1 1 1.0FE+05 195.8 32.35 05/07/94 15:41 127.5923 181 12 19 28 59 1 1 1.0FE+05 195.8 32.35 05/07/94 15:41 127.5923 181 12 19 28 59 1 1 1.0FE+05 195.8 32.35 05/07/94 15:41 127.5923 181 12 19 28 59 1 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.5938 181 12 19 30 61 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.5953 181 12 19 30 61 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.7950 181 12 19 30 61 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.7950 181 12 19 30 61 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.7950 181 12 19 30 61 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.7950 181 12 19 30 61 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.7950 181 12 25 32 69 1 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.7950 181 12 25 33 68 1 1 1.0FE+05 193.0 39.11 05/07/94 15:41 127.7950 181 12 25 33 69 1 1 1.0FE+05 193.0 39.6 4.0.44 05/07/94 23:27 127.9778 181 12 25 33 69 1 1	05/01/94 03:55	121.1635	178	11	8	22	41			1	1.13E+05	190.9	
05/05/94 23:55 125.9968 180 12 9 24 45 1 1.32E+04 33.5 0.47 05/05/94 01:02 126.0435 180 12 10 24 46 1 1 3.12E+04 131.5 1.59 05/05/94 01:02 126.0435 180 12 10 24 46 1 1 7.43E+04 131.5 1.59 05/05/94 07:12 126.3005 181 12 11 24 47 1 1 7.43E+04 160.7 5.98 05/05/94 07:12 126.3005 181 12 11 25 48 1 1 8.62E+04 160.7 7.77 05/05/94 08:38 126.3603 181 12 11 25 49 1 1 9.44E+04 163.3 9.20 05/06/94 10:50 126.4519 181 12 13 25 50 1 1 1.05E+05 160.5 114.0 05/06/94 10:50 126.4519 181 12 13 25 50 1 1 1.05E+05 160.5 114.0 05/06/94 03:01 127.0909 181 12 13 26 51 1 1 1.32E+05 181.0 28.73 05/07/94 03:07 127.1300 181 12 13 26 53 1 1 1.32E+05 181.0 28.73 05/07/94 06:50 127.2435 181 12 13 28 53 1 1 1.32E+05 181.0 28.73 05/07/94 06:50 127.2855 181 12 15 28 54 1 1 1.30E+05 188.1 30.40 05/07/94 07:07 127.1300 181 12 15 28 55 1 1 1.2E+05 185.0 31.43 05/07/94 09:52 127.2855 181 12 16 28 54 1 1 1.30E+05 185.0 31.43 05/07/94 09:52 127.350 181 12 16 28 56 1 1 1.22E+05 185.0 31.43 05/07/94 09:52 127.350 181 12 16 28 56 1 1 1.22E+05 185.8 32.35 05/07/94 14:12 127.5503 181 12 17 28 57 1 1 1.22E+05 187.9 34.43 05/07/94 14:12 127.5503 181 12 19 28 59 1 1 1.08E+05 185.8 32.35 05/07/94 14:12 127.5503 181 12 19 28 59 1 1 1.08E+05 185.8 32.35 05/07/94 15:41 127.5503 181 12 19 28 59 1 1 1.08E+05 182.3 39.71 05/07/94 15:41 127.5538 181 12 19 28 59 1 1 1.08E+05 185.8 32.35 05/07/94 15:41 127.5538 181 12 19 28 59 1 1 1.08E+05 185.8 30.91 1 05/07/94 15:41 127.5538 181 12 19 30 51 1 1.07E+05 193.0 39.71 05/07/94 15:41 127.5538 181 12 19 30 51 1 1.07E+05 193.0 39.71 05/07/94 15:41 127.7550 181 12 29 31 63 1 1 1.07E+05 193.0 39.71 05/07/94 15:41 127.7550 181 12 29 31 63 1 1 1.07E+05 193.0 39.71 05/07/94 15:41 127.7550 181 12 29 31 63 1 1 1.07E+05 193.0 39.71 1 05/07/94 15:41 127.7550 181 12 29 31 63 1 1 1.07E+05 193.0 39.71 1 05/07/94 15:41 127.7550 181 12 29 31 63 1 1 1.07E+05 193.0 39.71 1 05/07/94 15:41 127.7550 181 12 25 31 68 1 1 3.08E+04 196.7 143.5 140.9 140.9 127.3 148.2 140.9 140.9 127.3 148.2 140.9 140.9 127.3 140.9 12 12 12 13 1 64 1 1 1.08E+04 196	05/01/94 15:01	121.6261	178	11	8	23	42			1	4.24E+04	218.8	48.58
05/06/94 01:02 126.0435 180 12 10 24 46 1 3.12E+04 131.5 1.59 05/06/94 05:26 126.2284 180 12 11 24 47 1 7.43E+04 156.7 5.98 05/06/94 05:26 126.2284 180 12 11 24 47 1 7.43E+04 156.7 5.98 05/06/94 05:26 126.3005 181 12 11 25 48 1 1 9.44E+04 163.3 9.20 05/06/94 06:38 126.3603 181 12 12 25 49 1 9.44E+04 163.3 9.20 05/06/94 10:50 126.4519 181 12 13 25 50 1 1.05E+05 169.6 11.40 05/06/94 10:50 126.4519 181 12 13 25 50 1 1.05E+05 169.6 13.93 05/07/94 02:10 127.0909 181 12 13 25 50 1 1.15E+05 169.6 13.93 05/07/94 02:10 127.0909 181 12 13 28 53 1 1.32E+05 181.8 27.3 05/07/94 06:50 127.2435 181 12 13 28 53 1 1.32E+05 181.8 27.40 05/07/94 06:52 127.2865 181 12 15 28 55 1 1.28E+05 185.0 31.43 05/07/94 07:48 127.3250 181 12 16 28 56 1 1.12E+05 185.0 31.43 05/07/94 07:48 127.3250 181 12 17 28 57 1 1.22E+05 185.8 32.35 05/07/94 07:48 127.478 181 12 18 28 58 1 1.22E+05 185.8 32.35 05/07/94 14:12 127.5923 181 12 19 28 59 1 1.05E+05 187.8 34.43 05/07/94 15:41 127.6538 181 12 19 30 61 1 1.07E+06 183.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1.07E+06 183.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1.07E+06 193.0 39.11 05/07/94 15:41 127.7653 181 12 19 30 61 1 1.07E+06 193.0 39.11 05/07/94 15:41 127.7653 181 12 19 30 61 1 1.07E+06 193.0 39.11 05/07/94 15:41 127.7653 181 12 19 31 62 1 1 1.07E+06 193.0 39.11 05/07/94 15:41 127.7650 181 12 19 31 63 1 1 9.42E+04 196.7 41.75 05/07/94 16:21 127.7650 181 12 21 31 64 1 1 9.42E+04 196.7 41.75 05/07/94 16:21 127.7650 181 12 25 31 65 1 1 8.76E+04 198.8 42.91 05/07/94 23:27 127.9773 181 12 25 33 69 1 1 4.45E+04 196.7 41.75 05/07/94 23:27 127.9773 181 12 25 33 69 1 1 4.45E+04 196.7 41.36 05/07/94 23:27 127.9773 181 12 25 33 69 1 1 4.45E+04 136.6 216 05/07/94 23:27 127.9773 181 12 25 33 69 1 1 4.45E+04 136.6 216 05/07/94 23:27 127.9773 181 12 25 33 70 1 1 4.20E+04 136.6 2.16 05/07/94 23:27 127.9773 181 12 25 39 76 1 1 3.98E+04 136.6 2.16 05/08/94 04:57 128.2697 182 12 25 38 75 1 1 3.98E+04 136.6 2.16 05/08/94 04:57	05/04/94 15:31	124.6467	180	12	8	24	44	1		1	1.27E+05	174.5	19.00
05/06/94 05:26 128.284 180 12 11 24 47 1 7.43E+04 158.7 5.98 05/06/94 07:12 128.3005 181 12 11 25 48 1 1 8.62E+04 190.7 7.77 05/08/94 07:12 128.3005 181 12 11 25 48 1 1 8.62E+04 190.7 7.77 05/08/94 08:38 128.3603 181 12 13 25 48 1 1 9.44E+04 160.7 7.77 05/08/94 10:50 128.4519 181 12 13 25 50 1 1 0.05E+05 168.6 11.40 05/08/94 13:22 128.5573 181 12 13 26 51 1 1 1.15E+05 168.6 13.93 05/07/94 02:10 127.0909 181 12 13 26 51 1 1 1.33E+05 181.0 28.73 05/07/94 03:07 127.1300 181 12 13 28 53 1 1 1.32E+05 181.8 27.67 05/07/94 03:07 127.1300 181 12 13 28 53 1 1 1.32E+05 181.8 27.67 05/07/94 05:50 127.2435 181 12 14 28 54 1 1.30E+05 184.1 30.40 05/07/94 07:48 127.3250 181 12 15 28 55 1 1 1.28E+05 185.0 31.43 05/07/94 09:52 127.4114 181 12 17 28 57 1 1 1.22E+05 185.8 32.35 05/07/94 09:52 127.4114 181 12 17 28 57 1 1 1.22E+05 187.9 34.43 05/07/94 14:33 127.6678 181 12 19 29 50 1 1 1.07E+05 183.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1 1.07E+05 183.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1 1.07E+05 183.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1 1.07E+05 183.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1 1.07E+05 193.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1 1.07E+05 193.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1 1.07E+05 193.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1 1.07E+05 193.0 39.11 05/07/94 15:41 127.6538 181 12 19 31 62 1 1 1.07E+05 193.0 39.11 05/07/94 18:21 127.7650 181 12 23 31 63 1 1 9.42E+04 198.4 40.46 05/07/94 13:41 127.7650 181 12 23 31 63 1 1 9.42E+04 198.7 41.75 05/07/94 13:41 127.7650 181 12 25 37 65 1 1 3.86E+04 198.8 42.91 05/07/94 23:27 127.9773 181 12 25 38 69 1 1 3.86E+04 198.8 42.91 05/07/94 23:27 127.9773 181 12 25 38 69 1 1 4.45E+04 138.6 2.18 05/07/94 23:27 127.9773 181 12 25 39 69 1 1 4.45E+04 134.5 1.79 05/07/94 23:27 127.9773 181 12 25 39 77 1 1 3.86E+04 138.6 2.18 05/08/94 04:57 128.2067 182 12 25 38 75 1 1 3.88E+04 138.6 2.86 05/08/94 04:57 128.2067 182 12 25 38 75 1 1 3.88	05/05/94 23:55	125,9968	180	12	9	24	45		1		1.32E+04	93.6	
05/06/94 07:12 126.3005 181 12 11 25 48 1 1 8.62E+04 180.7 7.77 05/08/94 08:38 126.3603 181 12 12 25 49 1 9.44E+04 163.3 9.20 05/08/94 10:50 126.4519 181 12 13 25 50 1 1 1.05E+05 168.5 11.40 05/08/94 10:50 126.5573 181 12 13 26 51 1 1.15E+05 169.6 13.93 05/07/94 02:10 127.0909 181 12 13 27 52 1 1 1.33E+05 181.0 26.73 05/07/94 03:07 127.1300 181 12 13 28 53 1 1 1.32E+05 181.8 27.67 05/07/94 05:50 127.2435 181 12 14 28 54 1 1 1.30E+05 181.8 27.67 05/07/94 06:52 127.2855 181 12 15 28 55 1 1 1.28E+05 185.8 31.43 05/07/94 06:52 127.2856 181 12 15 28 55 1 1 1.28E+05 185.8 32.35 05/07/94 07:48 127.3250 181 12 16 28 56 1 1.27E+05 185.8 32.35 05/07/94 07:48 127.3250 181 12 18 28 58 1 1 1.22E+05 187.9 34.58 05/07/94 10:01 127.4176 181 12 18 28 58 1 1 1.22E+05 187.9 34.58 05/07/94 14:12 127.5923 181 12 19 28 59 1 1 1.08E+05 192.5 38.77 05/07/94 15:54 127.6967 181 12 19 29 60 1 1.07E+05 183.0 39.11 05/07/94 15:54 127.6969 181 12 19 30 61 1 1.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 20 31 63 1 1 0.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 20 31 63 1 1 0.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 20 31 63 1 1 0.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 20 31 63 1 1 0.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 20 31 63 1 1 0.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 20 31 63 1 1 0.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 20 31 63 1 1 0.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 20 31 66 1 1 0.07E+05 194.8 40.46 05/07/94 16:04 127.6538 181 12 25 31 68 1 1 0.07E+05 194.8 40.46 05/07/94 20:29 127.8537 181 12 25 31 68 1 1 0.07E+05 194.8 40.46 05/07/94 20:29 127.8537 181 12 25 31 68 1 1 0.07E+05 194.8 40.46 05/07/94 20:29 127.8537 181 12 25 31 68 1 1 0.07E+05 194.8 40.46 05/07/94 20:29 127.8537 181 12 25 31 68 1 1 0.07E+05 194.8 40.91 05/07/94 20:29 127.8537 181 12 25 31 68 1 1 0.07E+05 194.8 40.91 05/07/94 20:29 127.8537 181 12 25 31 68 1 1 0.07E+05 194.8 40.91 05/07/94 20:29 127.8537 181 12 25 31 68 1 1 0.07E+05 194.8 40.91 05/07/94 20:29 127.8537 181 12 25 31 68 1 1	05/06/94 01:02	126.0435	180	12	10	24	46		1		3.12E+04	131.5	1.59
05/08/94 08:38 128.3603 181 12 12 25 49 1 9.44E-04 163.3 9.20 05/08/94 10:50 126.4519 181 12 13 25 50 1 1.05E+05 169.6 11.40 05/08/94 13:22 128.5573 181 12 13 26 51 1 1.15E+05 169.6 13.93 05/07/94 02:10 127.0909 181 12 13 26 51 1 1.33E+05 181.0 28.73 05/07/94 02:01 127.0909 181 12 13 28 53 1 1.33E+05 181.8 27.67 05/07/94 06:50 127.2435 181 12 13 26 54 1 1.30E+05 184.1 30.40 05/07/94 06:52 127.2865 181 12 15 28 55 1 1.28E+05 185.0 31.43 05/07/94 07:48 127.3250 181 12 16 28 56 1 1.27E+05 185.8 32.35 05/07/94 09:52 127.4114 181 12 17 28 57 1 1.22E+05 185.8 32.35 05/07/94 09:52 127.4114 181 12 17 28 57 1 1.22E+05 187.8 34.43 05/07/94 10:01 127.4778 181 12 18 28 58 1 1.22E+05 187.9 34.58 05/07/94 10:01 127.4778 181 12 19 28 59 1 1.08E+05 192.5 38.77 05/07/94 15:41 127.6538 181 12 19 29 50 1 1.07E+05 183.0 39.11 05/07/94 15:54 127.6629 181 12 19 29 60 1 1.07E+05 183.0 39.11 05/07/94 18:14 127.6538 181 12 19 30 61 1 1.02E+05 194.5 40.24 05/07/94 18:04 127.6629 181 12 19 31 62 1 1 1.01E+05 194.8 40.46 05/07/94 18:04 127.6629 181 12 20 31 63 1 1 9.49E+04 195.0 40.63 05/07/94 18:04 127.7650 181 12 21 31 64 1 1 9.42E+04 196.7 41.75 05/07/94 18:04 127.7650 181 12 21 31 66 1 1 9.42E+04 196.7 41.75 05/07/94 19:30 127.8125 181 12 23 31 68 1 1 9.42E+04 196.7 41.75 05/07/94 19:30 127.8125 181 12 23 31 68 1 1 9.42E+04 196.7 41.75 05/07/94 19:30 127.8125 181 12 25 31 68 1 1 3.76E+04 203.8 45.04 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 3.76E+04 203.8 45.04 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 3.76E+04 203.8 45.04 05/07/94 23:27 127.9773 181 12 25 33 69 1 1 3.38E+04 138.6 2.16 05/08/94 04:35 128.1915 182 12 25 38 73 3 3.39E+04 138.6 2.16 05/08/94 04:35 128.1915 182 12 25 38 73 3 3.39E+04 138.6 2.16 05/08/94 04:35 128.1915 182 12 25 38 75 1 3.39E+04 138.6 2.16 05/08/94 04:35 128.1915 182 12 25 38 75 1 1 3.38E+04 138.6 2.16 05/08/94 04:35 128.1915 182 12 25 38 75 1 1 3.38E+04 138.6 2.16 05/08/94 04:35 128.1915 182 12 25 38 75 1 1 3.38E+04 138.6 2.16 05/08/94 04:35 128.1915 182 12 25 38 75 1 1 3.38E+04 138.6 2.16 05/08/94 04	05/06/94 05:26	126.2284	180	12	11	24	47		1		7.43E+04	158.7	5.98
05/06/94 10:50 126.4519 181 12 13 25 50 1 1.05E+05 168.6 13.93 15/06/94 13:22 128.5573 181 12 13 26 51 1 1.15E+05 169.6 13.93 05/07/94 03:07 127.0909 181 12 13 27 52 1 1.33E+05 181.0 28.73 05/07/94 03:07 127.1300 181 12 13 28 53 1 1.32E+05 181.8 27.67 05/07/94 05:50 127.2435 181 12 14 28 54 1 1.30E+05 184.1 30.40 05/07/94 06:52 127.2855 181 12 15 28 55 1 1.28E+05 185.0 31.43 05/07/94 07:48 127.3250 181 12 16 28 56 1 1.27E+05 185.8 32.35 05/07/94 07:48 127.3250 181 12 17 28 57 1 1.22E+05 187.8 34.43 05/07/94 10:01 127.4178 181 12 18 28 58 1 1.22E+05 187.8 34.43 05/07/94 10:01 127.4178 181 12 18 28 58 1 1.28E+05 187.9 34.58 05/07/94 14:12 127.5923 181 12 19 28 59 1 1.08E+05 192.5 38.77 05/07/94 15:41 127.6538 181 12 19 29 60 1 1.07E+05 193.0 39.11 05/07/94 15:41 127.6538 181 12 19 30 61 1 1.02E+05 194.5 40.24 05/07/94 15:14 127.7650 181 12 19 31 62 1 1.01E+05 194.8 40.46 05/07/94 17:11 127.7650 181 12 21 31 64 1 9.42E+04 196.7 41.75 05/07/94 19:30 127.8153 181 12 23 31 64 1 9.42E+04 196.7 41.75 05/07/94 19:30 127.8153 181 12 23 31 66 1 8.05E+04 201.1 44.05 05/07/94 23:42 127.9678 181 12 25 31 68 1 8.05E+04 201.1 44.05 05/07/94 23:42 127.9678 181 12 25 31 68 1 8.05E+04 201.1 44.05 05/07/94 23:42 127.9678 181 12 25 31 68 1 8.05E+04 201.1 44.05 05/07/94 23:42 127.9678 181 12 25 31 68 1 8.05E+04 201.1 44.05 05/07/94 23:42 127.9678 181 12 25 31 68 1 8.05E+04 201.1 44.05 05/07/94 23:42 127.9678 181 12 25 31 68 1 8.05E+04 201.1 44.05 05/07/94 23:52 127.9678 181 12 25 3	05/06/94 07:12	126.3005	181	12	11	25	48			1	8.62E+04	180.7	
SS/06/94 13:22 128.5573 181 12 13 26 51 1 1.15E+05 189.6 13.93	05/06/94 08:38	126,3603	181	12	12	25	49		1		9.44E+041	163.3	9.20
05/07/94 02:10 127.0909 181 12 13 27 52 1 1.33E+05 181.0 28.73 05/07/94 03:07 127.1300 181 12 13 28 53 1 1.32E+05 181.8 27.67 05/07/94 05:50 127.2435 181 12 14 28 54 1 1.30E+05 184.1 30.40 05/07/94 05:52 127.2865 181 12 15 28 55 1 1.28E+05 185.0 31.43 05/07/94 07:48 127.3250 181 12 16 28 56 1 1.27E+05 185.8 32.35 05/07/94 07:48 127.3250 181 12 18 28 57 1 1.22E+05 187.9 34.58 05/07/94 09:52 127.4114 181 12 17 28 57 1 1.22E+05 187.9 34.58 05/07/94 10:01 127.4178 181 12 18 28 58 1 1.22E+05 187.9 34.58 05/07/94 10:01 127.5923 181 12 19 28 59 1 1.08E+05 192.5 38.77 05/07/94 15:41 127.6538 181 12 19 29 60 1 1.07E+05 193.0 39.11 05/07/94 15:54 127.6629 181 12 19 30 61 1 1.02E+05 194.5 40.24 05/07/94 15:54 127.6629 181 12 19 31 62 1 1.01E+05 194.8 40.48 05/07/94 18:04 127.0698 181 12 21 31 64 1 9.42E+04 195.0 40.63 05/07/94 19:30 127.8125 181 12 23 31 64 1 9.42E+04 196.7 41.75 05/07/94 19:30 127.8537 181 12 23 31 68 1 8.86E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 9.87E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 1 1 3.86E+04 138.6 2.16 05/07/94 23:27 127.9773 181 12 25 31 68 7 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 7 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 7 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 7 1 7.35E+04 201.1 44.05 05/07/94 23:27 127.9773 181 12 25 31 68 7 1 1.36E+04 138.6 2.16 05/08/94 04:35 128.4515 182 12 25 38 73 1 3 3.39E+04 134.5 1.79 05/08/94 05:03 128.2111 182 12 25 38 77 7 1 1 8.82E+04 136.6 2.26 05/08/94 05:03 128.2111 182 12 28 39 76 1 1 5.05E+04 136.6 2.26 05	05/08/94 10:50	126,4519	181	12	13	25	50		1		1.05E+05	168.5	
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